Transmission System Impact Study
Powerflow Analysis

5103/04 Routing Through MWRDGC's Property at the Mainstream Pumping Station at Hodgkins - Rev. 1

ComEd
An Exelon Company

Transmission Planning

April 18, 2002

Tech Studies Engineer: Rabi Kiran
Approved: ***Frank Bristol***
Rev. 1: ***Frank Bristol*** **4/23/02**

INTRODUCTION

Objectives of Powerflow Analysis

It has been brought to Transmission Planning's attention that a 50 year lease for ComEd's right-of-way on lines 5103 and 5104 terminates with the Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) on July 31, 2002. Both lines originating from TSS 51 McCook serve ESS D775 MWRDGC's Mainstream Pumping Station located in Hodgkins. The lines continue and split southwest towards Station 18 Will County and east towards TSS 115 Bedford Park. Approximately 0.5 miles of 5103/04 that networks with TSS 115 Bedford Park via TDC 550 Clearing is on leased right-of-way on MWRDGC's property. MWRDGC has asked ComEd to remove the lines from their property.

The objective of powerflow analysis is to assess the impact caused by removing the 5103/04 taps from the MWRDGC property to the taps to TDC 550 Clearing and to ensure that the removal does not overload any elements of the transmission system per ComEd Transmission Planning Criteria. The analysis will determine if any relevant facilities on the ComEd system would be thermally overloaded due to the removal of the 5103/04 taps from the MWRDGC property to the taps to TDC 550 Clearing. The incremental impacts on the thermal loading of selected transmission elements are reported in order to quantify the overloads caused by the removal of the Clearing taps. This initial study does not address mitigation of overloads.

Study Model

Powerflow simulations were performed with 2003 base cases. Both high-load (90/10 forecast) and normal peak load (50/50 forecast) cases were developed without the 5103/04 tap to TDC 550 Clearing. Appendix II provides a list all relevant generators that were included in the study. All significant transmission system upgrades that are expected to be completed prior to 2003 were included in the cases. Due to basecase overloads resulting from generation dispatch assumptions, the Ridgeland (B) phase-shifter was assumed to be upgraded to ±15°. Appendix III provides a list of the basecase phase-shifter settings.

Using the powerflow models, base case and contingency scenarios were analyzed to evaluate the incremental impact due to the proposed generation addition. The resultant loadings on any ComEd facilities greater than 100% of the applicable rating for system normal, and selected single and double contingencies in accordance with ComEd's Transmission Planning Criteria were identified.

SUMMARY OF STUDY RESULTS

Discussion

Exhibit 1 shows the incremental impact on the loading of selected transmission elements due the removal of the 5103/04 Clearing taps for normal transmission system configuration. The summer normal (SN) and summer emergency (SE) ratings are shown for reference. Autotransformers #82 and # 83 at Station 13 Crawford exceeded 100% of their summer normal thermal limits under normal operating conditions for the peak load (50/50) case.

Exhibit 2 shows the incremental impact on percent loading of transmission elements due the proposed removal of the taps 5103/04 to TDC 550 Clearing for selected contingencies. The applicable rating is dependent upon the base case (90/10 or 50/50 load forecast) and particular contingencies studied per ComEd Transmission Planning Criteria. A summary of applicable ratings that must be observed per ComEd Transmission Planning Criteria for various scenarios is provided in Appendix I.

Conclusion and Recommendations

Powerflow studies have identified many relevant thermal overloads per ComEd Transmission Planning Criteria due to the removal of the 5103/04 taps to TDC 550 Clearing. In addition, the removal of the 5103/04 taps to TDC 550 Clearing decreases the reliability by leaving this station on a radial connection from TSS 115 Bedford Park. Significant overloads indicate that the network connection for lines 5103/04 will need to be maintained.

Transmission Planning considered alternatives such as either routing the lines to TSS 51 McCook, TSS 192 Ridgeland or Station 13 Crawford. But clearly, these options would be more costly due to the fact that they are farther away and would result in higher material and right of way acquistion costs. Thus, the most cost effective solution is a near like-for-like reconnection of lines 5103 and 5104 as depicted on PD# 0P040013.

Exhibit 1: Base Transmission Loading With and Without the 5013/04 Tap Removed

Facility (MW flow direction)	MVA Loading Basecase		MVA Loading with 5103/04 Tap Removed		MVA Ratings	
	50/50 Case	90/10 Case	50/50 Case	90/10 Case	SN	SE
@ TSS 51 McCook						
L5103 (from D775)	-243.0	-248.0	-63.0	-67.2	351	445
L5104 (from D775)	-127.0	-124.0	-36.2	-39.8	305	318
L5105 (to Ridgeland)	100.0	100.0	64.7	62.4	305	390
L5107 (to Ridgeland)	118.0	127.0	55.1	64.5	308	390
L5117 (to LaGrange)	300.0	308.0	260.0	268.0	308	386
L5118 (to LaGrange)	271.0	277.0	243.0	249.0	308	386
Auto-trf #82 (to 138kV)	-317.0	-334.0	-370.0	-397.0	400	465
Auto-trf #84 (to 138kV)	-307.0	-324.0	-381.0	-387.0	400	465
@ TSS 115 Bedford Park						
L5103 (to Clearing)	267.0	270.0	30.7	32.6	351	445
L5104 (to Clearing)	233.0	237.0	68.5	72.7	305	390
L1322 (to Ford City)	165.0	191.0	208.0	235.0	332	437
L1324 (to Ford City)	135.0	160.0	186.0	212.0	351	445
L11605 (to Bedford Park)	34.8	34.6	57.9	57.7	305	390
L11606 (to Bedford Park)	33.0	29.7	59.3	57.6	305	390
Auto-trf #81 (to 138kV)	-275.0	-294.0	-230.0	-249.0	402	480
Auto-trf #82 (to 138kV)	-287.0	-303.0	-218.0	-234.0	402	465
Auto-trf #83 (to 138kV)	-242.0	-257.0	-171.0	-187.0	402	480
Auto-trf #84 (to 138kV)	-319.0	-339.0	-277.0	-296.0	400	465
@ Station 18 Will County						
L1802 (to Willow Springs)	121.0	136.0	175.0	189.0	290	290
L1807 (to Willow Springs)	110.0	118.0	151.0	158.0	305	394
@ TSS 116 Goodings Grove						
L11605 (to Bedford Park)	104.0	112.0	72.6	80.9	305	390
L11606 (to Bedford Park)	108.0	118.0	69.0	78.3	305	390
@ Crawford Crawford						
Auto-trf #82 (to 138kV)	-374.0	-381.0	**-434.0 ***	-442.0	420	480
Auto-trf #83 (to 138kV)	-377.0	-386.0	**-421.0 ***	-430.0	420	480

*The rating exceeds 100% of its allowable summer normal rating and is in violation of the ComEd Transmission Planning criteria.

Exhibit 2: Contingency Transmission Loading With and Without the 5013/04 Tap Removed

#	Case	Facilities Out-of-Service	Critical Element	Basecase Loading	Operating Steps/Phase-Shifter Adjustments Taken to Mitigate Basecase Overloads	Loading After Operating Steps Taken	Loading with 5103/04 Taps Removed
1	90/10	L1306	Auto-trf #84 @ McCook B Auto-trf #83 @ Crawford Y	<90.0% SE <90.0% SE	No basecase overload.		**114.0% SE** **100.8% SE**
2	90/10	L1321 w/ L6721	L1306 (Ridgeland-D799) B L4527 (Jeff-Kingsbury) B L4525 (Jeff-Kingsbury) R	109.7% SE 120.5% SE <90.0% SE	Close TSS 82 Crosby R-B 138kVBus Tie	110.9% SE 105.6% SE 100.5% SE	
2A	90/10	L1321 w/ L6721	L1306 (Ridgeland-D799) B L4527 (Jeff-Kingsbury) B L4525 (Jeff-Kingsbury) R	110.9% SE 105.6% SE 100.5% SE	Close Crawford Y-G 138kV Bus Tie	<90.0% SE 103.6% SE 102.1% SE	
2B	90/10	L1321 w/ L6721	L1306 (Ridgeland-D799) B L4527 (Jeff-Kingsbury) B L4525 (Jeff-Kingsbury) R	<90.0% SE 103.6% SE 102.1% SE	2A plus adjust P/S accordingly: Northwest (B) - 215MW Crawford (Y) - 335MW	<90.0% SE 98.1% SE 96.8% SE	**102.3% SE** 99.7% SE 97.8% SE
3	90/10	L1311 (345kV) w/ Autotransformer #83 @ Crawford	Auto-trf #82 @ McCook R L5105 (McCook-Ridgeland) R L17723 (Garfield-Taylor) B Auto-trf #82 @ Crawford G	102.8% SE 113.4% SE 99.0% SE <90.0% SE	P/S Adjustments: Crawford (Y): 225MW State Line (R): 145MW	97.9% SE 96.6% SE 99.6% SE <90.0% SE	**121.7% SE** 94.3% SE 95.3% SE **102.4% SE**
3A	90/10	L1311 (345kV) w/ Autotransformer #83 @ Crawford	Auto-trf #82 @ McCook R L5105 (McCook-Ridgeland) R L17723 (Garfield-Taylor) B Auto-trf #82 @ Crawford G	102.8% SE 113.4% SE 99.0% SE <90.0% SE	P/S Adjustments: Crawford (Y): 225MW State Line (R): 145MW Close Crawford R-B 345kB Bus Tie Restore Autotransformer #83 @ Crawford assuming the fault is on the line.	<90.0% SE <90.0% SE 96.7% SE <90.0% SE	94.4% SE <90.0% SE 94.2% SE <90.0% SE
3B	90/10	L1311 (345kV) w/ Autotransformer #83 @ Crawford	Auto-trf #82 @ McCook R L5105 (McCook-Ridgeland) R L17723 (Garfield-Taylor) B	102.8% SE 113.4% SE 99.0% SE	Close 345kB R-B Bus Tie at Crawford Restore Autotransformer #83 @ Crawford assuming the fault is on the line.	<90.0% SE <90.0% SE 96.7% SE	97.0% SE <90.0% SE 94.2% SE
4	90/10	L10803 (345kV) w/ Autotransformer #84	Auto-trf #82 @ Crawford G L1306 (Ridgeland-D799) B	98.8% SE 90.9% SE	No basecase overload.		**127.9% SE** **135.4% SE**
5	90/10	L10804 (345kV) w/ Autotransformer #84	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	100.3% SE <90.0% SE	P/S Adjustments: Crawford (Y) : 275MW	98.4% SE <90.0% SE	99.3% SE **102.4% SE**
5A	90/10	L10804 (345kV) w/ Autotransformer #84	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	100.3% SE <90.0% SE	Close 345kB R-B Bus Tie at Restore Autotransformer #82 @ McCook assuming the fault is on the line.	<90.0% SE <90.0% SE	**101.9% SE** **102.8% SE**

#	Case	Facilities Out-of-Service	Critical Element	Basecase Loading	Operating Steps/Phase-Shifter Adjustments Taken to Mitigate Basecase Overloads	Loading After Operating Steps Taken	Loading with 5103/04 Taps Removed
5B	90/10	L10804 (345kV) w/ Autotransformer #84	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	100.3% SE <90.0% SE	P/S Adjustments: Crawford (Y) : 275MW Close 345kV R-B Bus Tie at Restore Autotransformer #82 @ McCook assuming the fault is on the line.	<90.0% SE <90.0% SE	99.3% SE **102.6% SE**
6	90/10	L11604 (345kV)	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G L4525 (Jeff-Kingsbury) R	100.1% SE <90.0% SE <90.0% SE	P/S Adjustments: Crawford (Y): 275MW	97.6% SE <90.0% SE <90.0% SE	**113.0% SE** **102.1% SE** **102.9% SE**
7	90/10	L11617 (345kV)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	100.1% SE	P/S Adjustments: Crawford (G): 275MW	97.9% SE <90.0% SE <90.0% SE	**118.6% SE** 99.7% SE **126.8% SE**
8	90/10	Auto #82- McCook	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	100.3% SE <90.0% SE	P/S Adjustments: Crawford (Y): 275MW	98.4% SE <90.0% SE	**120.2% SE** **101.3% SE**
9	90/10	Auto #84 - McCook	Auto-trf #82 @ Crawford G L1306 (Ridgeland-D799) B	98.8% SE 90.9% SE	No basecase overload.		**127.9% SE** **135.3% SE**
10	90/10	Auto#82-Crawford	L5107 (McCook-Ridgeland) B Auto-trf #84 @ McCook B Auto-trf #83 @ Crawford Y	114.8% SE 94.5% SE	P/S Adjustments: Crawford (G): 245MW Ridgeland (B): 145MW	96.6% SE <90.0% SE <90.0% SE	<90.0% SE **119.7% SE** **100.4% SE**
11	90/10	Auto#83 -Crawford	Auto-trf #82 @ McCook R L5105 (McCook-Ridgeland) R L4525 (Jeff-Kingsbury) R Auto-trf #82 @ Crawford G	98.6% SE 108.6% SE <90.0% SE <90.0% SE	P/S Adjustments: Crawford (Y): 235MW Franklin Pk (R): 315MW	96.0% SE 98.8% SE 99.1% SE <90.0% SE	**121.3% SE** 94.3% SE **104.2% SE** **104.5% SE**
12	90/10	Crawford - U7	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y	96.6% SE 97.6% SE	No basecase overload.		**111.5% SE** **108.5% SE**
13	50/50	L1311(345kV) w/ Autotrf #83 @ Crawford & U7 (Crawford)	L5105 (McCook-Ridgeland) R Auto-trf #82 @ McCook R Auto-trf #82 @ Crawford G	127.9% SE 102.9% SE 96.9% SE	P/S Adjustments: Crawford (Y): 115MW	94.8% SE 94.0% SE 94.5% SE	92.6% SE **116.5% SE** **111.3% SE**
13A	50/50	L1311(345kV) w/ Autotrf #83 @ Crawford & U7 (Crawford)	L5105 (McCook-Ridgeland) R Auto-trf #82 @ McCook R Auto-trf #82 @ Crawford G	127.9% SE 102.9% SE 96.9% SE	Close R-B 345kV Bus Tie @ Crawford and Restore Tr#83	<90.0% SE <90.0% SE <90.0% SE	<90.0% SE 97.4% SE 91.7% SE
13B	50/50	L1311(345kV) w/ Autotrf #83 @ Crawford & U7 (Crawford)	L5105 (McCook-Ridgeland) R Auto-trf #82 @ McCook R Auto-trf #82 @ Crawford G	127.9% SE 102.9% SE 96.9% SE	P/S Adjustments: Crawford (Y): 115MW Close R-B 345kV Bus Tie @ Crawford and Restore Tr#83	<90.0% SE <90.0% SE <90.0% SE	<90.0% SE 91.0% SE 92.5% SE

#	Case	Facilities Out-of-Service	Critical Element	Basecase Loading	Operating Steps/Phase-Shifter Adjustments Taken to Mitigate Basecase Overloads	Loading After Operating Steps Taken	Loading with 5103/04 Taps Removed
14	50/50	L10803 (345kV) w/ Autotrf #84 @ McCook & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	108.7% SE 96.2% SE <90.0% SE	P/S Adjustments: Crawford (G): 215MW	98.8% SE 95.5% SE <90.0% SE	**127.1% SE** **108.3% SE** **124.3% SE**
14A	50/50	L10803 (345kV) w/ Autotrf #84 @ McCook & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	108.7% SE 96.2% SE <90.0% SE	Close R-B 345kV Bus Tie @ McCook Restore Autotransformer #84 @ McCook assuming the fault is on the line.	108.8% SE 96.1% SE <90.0% SE	**114.7% SE** **111.1% SE**
14B	50/50	L10803 (345kV) w/ Autotrf #84 @ McCook & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	108.8% SE 96.1% SE <90.0% SE	P/S Adjustments: Crawford (G): 215MW Close R-B 345kV Bus Tie @ McCook Restore Autotransformer #84 @ McCook assuming the fault is on the line.	99.2% SE 95.1% SE <90.0% SE	**128.6% SE** **106.7% SE** **126.6% SE**
15	50/50	L10804 (345kV) w/ Autotrf #82 @ McCook & U7 (Crawford)	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	111.3% SE 95.3% SE	P/S Adjustments: Crawford (Y) - 215MW	98.6% SE 94.6% SE	**119.7% SE** **111.1% SE**
15A	50/50	L10804 (345kV) w/ Autotrf #82 @ McCook & U7 (Crawford)	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	111.3% SE 95.3% SE	Close R-B 345kV Bus Tie @ McCook Restore Autotransformer #82 @ McCook assuming the fault is on the line.	96.2% SE 98.6% SE	**113.4% SE** **112.8% SE**
15B	50/50	L10804 (345kV) w/ Autotrf #82 @ McCook & U7 (Crawford)	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	111.3% SE 95.3% SE	P/S Adjustments: Crawford (Y) - 215MW Close R-B 345kV Bus Tie @ McCook Restore Autotransformer #82 @ McCook assuming the fault is on the line.	<90.0% SE 95.5% SE	**113.4% SE** 100.0% SE
16	50/50	L11604 (345kV) & U7 (Crawford)	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G L4525 (Jeff-Kingsbury) R	109.4% SE 94.2% SE <90.0% SE	P/S Adjustments: Crawford (Y) - 215MW	99.9% SE 94.0% SE <90.0% SE	**115.1% SE** **111.6% SE** 97.2% SE
17	50/50	L11617(345kV) & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	109.1% SE 96.2% SE <90.0% SE	P/S Adjustments: Crawford (G) - 215MW	99.4% SE 95.7% SE <90.0% SE	**119.8% SE** **109.5% SE** 97.2% SE
18	50/50	Auto-trf #82 @ McCook & U7 (Crawford)	Auto-trf #83 @ Crawford Y Auto-trf #82 @ Crawford G	111.3% SE 95.3% SE	P/S Adjustments: Crawford (G) - 195MW	98.6% SE 94.6% SE	**119.9% SE** **110.9% SE**
19	50/50	Auto-trf #84 @ McCook & U1 (Byron)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	96.7% SE <90.0% SE 91.9% SE	No basecase overload.		**126.1% SE** 97.5% SE **133.0% SE**

#	Case	Facilities Out-of-Service	Critical Element	Basecase Loading	Operating Steps/Phase-Shifter Adjustments Taken to Mitigate Basecase Overloads	Loading After Operating Steps Taken	Loading with 5103/04 Taps Removed
20	50/50	Auto-trf #84 @ McCook & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y L1306 (Ridgeland-D799) B	108.7% SE 96.1% SE <90.0% SE	P/S Adjustments: Crawford (G) - 215MW	98.6% SE 95.5% SE <90.0% SE	**121.1% SE** **108.6% SE** **124.3% SE**
21	50/50	Auto-trf #81 @Crawford & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y	91.6% SE 101.6% SE	P/S Adjustments: Crawford (Y) - 245MW	91.1% SE 96.3% SE	**104.9% SE** **104.6% SE**
22	50/50	Auto-trf #82 @Crawford & U7 (Crawford)	Auto-trf #84 @ McCook B Auto-trf #83 @ Crawford Y L5107 (McCook-Ridgeland) B	94.8% SE 98.8% SE 128.6% SE	P/S Adjustments: Crawford (G) - 195MW Ridgeland (B) - 95MW	<90.0% SE 97.3% SE 95.9% SE	**117.3% SE** **110.8% SE** <90.0% SE
23	50/50	Auto-trf #83 @Crawford & U7 (Crawford)	Auto-trf #82 @ McCook R Auto-trf #82 @ Crawford G L5105 (McCook-Ridgeland) R L4525 (Jefferson-Kingsbury) R	99.1% SE 97.5% SE 122.6% SE <90.0% SE	P/S Adjustments: Crawford (Y) - 115MW Franklin Pk (R) - 335MW State Line (R) - 75MW	91.9% SE 96.3% SE 94.8% SE 98.7% SE	**116.0% SE** **113.4% SE** 91.5% SE **103.0% SE**
24	50/50	Auto-trf #84 @Crawford & U7 (Crawford)	Auto-trf #82 @ Crawford G Auto-trf #83 @ Crawford Y	100.0% SE 93.1% SE	No basecase overload.		**111.5% SE** **103.6% SE**

APPENDIX I

Adequacy Criteria for Reinforcement Per ComEd Transmission Planning Criteria

Index #	Contingency	'90/10' Forecast	'50/50' Forecast
1	Normal	**All elements within Emergency Limits**	**All elements within Normal Limits**
2	1 Gen Unit	**All elements within Emergency Limits**	**All elements within Normal Limits**
3	2 Underground Lines	**All elements within Emergency Limits**	**All elements within Emergency Limits**
4	1 Overhead Line	**All elements within Emergency Limits**	**All elements within Emergency Limits**
5	1 Transformer	**All elements within Emergency Limits**	**All elements within Emergency Limits**
6	1 Underground Line & 1 Gen Unit		**All elements within Emergency Limits**
7	Two Units		**All elements within Emergency Limits**
8	1 Overhead Line & 1 Gen Unit		**All elements within Emergency Limits**
9	1 Gen Unit & 1 Transformer		**All elements within Emergency Limits**

APPENDIX II
Relevant Generation Dispatched in Study

Name of Generating Unit	**Connection**	**MW Output**
State Line U3 (B)	138kV Bus (B)	187
State Line U4 (R)	138kV Bus (R)	303
Fisk U19 (R & B)	138kV Bus (R & B)	322
Calumet Peakers (B)	138kV Bus (B)	100
Calumet Peakers (R)	138kV Bus (R)	135
Fisk Peaker (B)	12kV Bus (B) Switchouse #2	88
Fisk Peaker (R)	12kV Bus (R) Switchouse #2	90
Elwood Energy Center (B)	345kV Lines (B)- 1220, 11620	750
Elwood Energy Center (R)	345kV Lines (R)- 1222, 11622	600
Kendall Energy Center (B)	345kV Lines (B)- 10805, 93505	580
Kendall Energy Center (R)	345kV Lines (R)- 10806, 2310	580
Southeast Chicago Energy Center (B)	138kV Lines (B)- 94402	154
Southeast Chicago Energy Center (R)	138kV Lines (R)- 94401	154
River Energy Center (B)	138kV Lines (B)- 15002, 0703	151
River Energy Center (R)	138kV Lines (R)- 15001, 0704	151
Crete Energy Center (B)	345kV Lines (B)- 6607, 94507	320
University Park North Energy Center (R)	345kV Lines (R)- 6608, 97008	450
Rocky Road Energy Center (B)	138kV Line 18512	110
Rocky Road Energy Center (R)	138kV Line 18513	250

APPENDIX III
Basecase Phase Shifter Settings

Name/Location	MW Flow	MW Range	Angle	Angle Range
Crawford (G)	293.9	300,290	-7.89°	± 15.17 °
Crawford (Y)	294.2	300,290	-6.39°	± 15.17°
Franklin Park (B)	155.0	160,150	5.32°	± 15.17°
Franklin Park (R)	284.8	290,280	0.92°	± 15.00°
Harbor (B)	150.1	155,145	5.08°	± 15.00°
Northwest (B)	155.4	160,150	-19.38°	± 30.00°
Northwest (R)	55.9	145,135	-15.17°	± 15.17°
Ridgeland (B)	194.7	200,190	8.06°	± 15.17°
State Line (B)	125.0	130,120	7.37°	± 10.08°
State Line (R)	125.0	130,120	6.54°	± 10.08°